

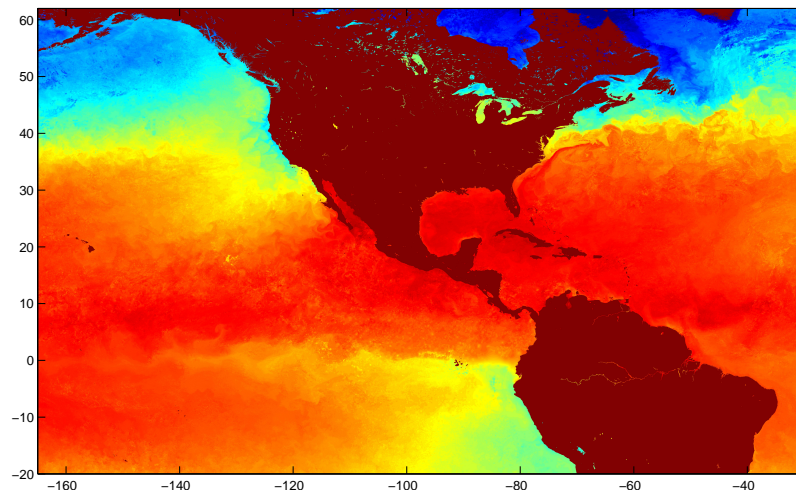
# Validation of High-Resolution, Multi-Satellite Sea Surface Temperature

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## Multi-sensor Ultra-high Resolution (MUR) SST Analysis Project

Production of **high-resolution (1~2 km)**, **daily** SST maps from **multi-satellite** data sets.



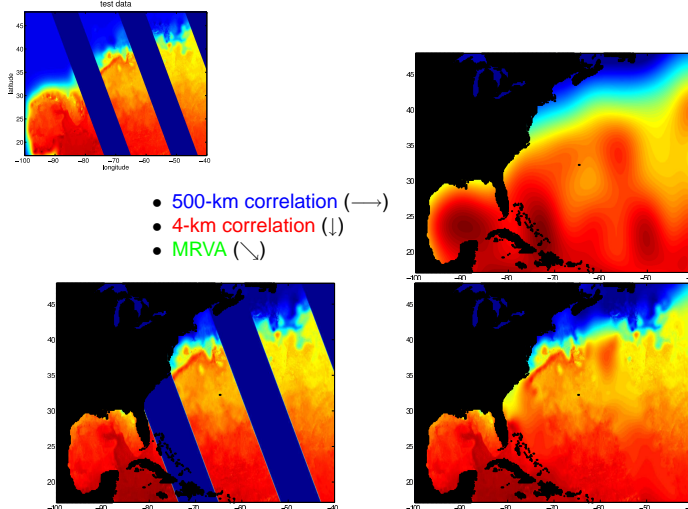
MUR will be available through PO.DAAC (JPL) in 2010.

## Multi-Resolution Variational Analysis (MRVA)

Satellite-based SST data are **irregularly-sampled** by different sensor types. We employ a **wavelet-based**, multi-resolution analysis technique to ensure consistency of our analysis with the self-similar (power-law) characteristics observed empirically over a wide range of wavenumber spectrum. MRVA:

- performs interpolation at different **scales** ( $1/4^\circ$ ,  $1/8^\circ$ ,  $1/16^\circ$  ...)
- preserves both long correlations and small-scale features.
- is used for both *single-sensor analysis for bias correction* and *multi-sensor analysis for production*.

MRVA Example (interpolate test data)



## Sea Surface Temperature (SST) Data

- *Research uses*: weather forecasts, global climate, ocean fronts, fishery/bio-productivity, air-sea interaction, tropical cyclones, ...
- *Measurements*: ships of opportunity, buoys, and **satellites**, e.g.:

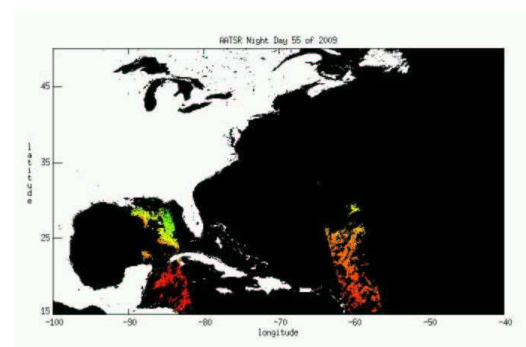
Instrument or Satellite	Radiometer/Orbit	Resolution (km)	Error (RMS)	Issues
AVHRR	IR/Polar	1	0.6°C	Clouds, aerosols
MODIS	IR/Polar	1	0.4°C	Clouds, aerosols
AATSR	IR/Polar	1	0.3°C	Clouds
AMSRE	MW/Polar	25	0.5°C	Land, rain
TMI	MW/Equatorial	25	0.5°C	Land, rain
GOES Imager	IR/Geostationary	6	1.0°C	Clouds, aerosols
SEVIRI	IR/Geostationary	6	0.7°C	Clouds, aerosols
MT-SAT-1R	IR/Geostationary	6	~ 0.7°C	Clouds, aerosols

**infra-red (IR)**: since ~1981, higher resolution.

**micro-wave (MW)**: less prone to weather.

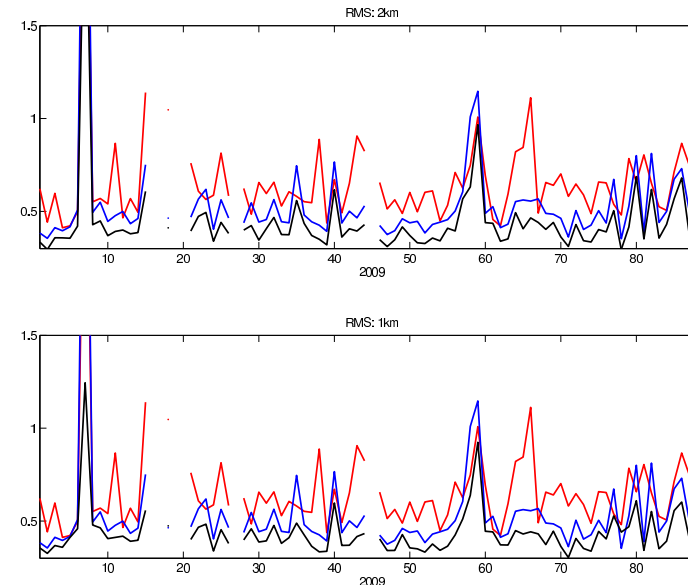
⇒ Single-sensor bias (calibration) data are available in the data format defined by the Group for High Resolution SST (GHRSSST).

## Comparison to AATSR satellite swaths



## RMS errors against AATSR values

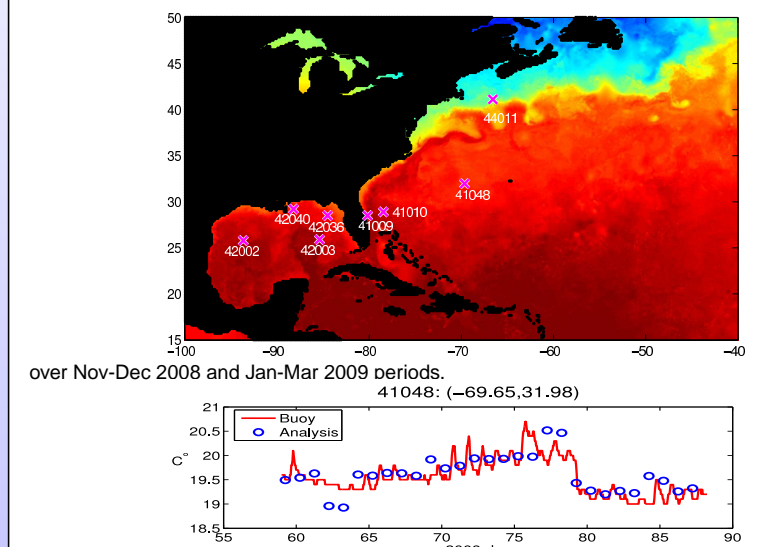
Red is AMSRE; blue is MODIS-A; black is 3-sensor combination (AMSRE, MODIS-A & -T) analysis.



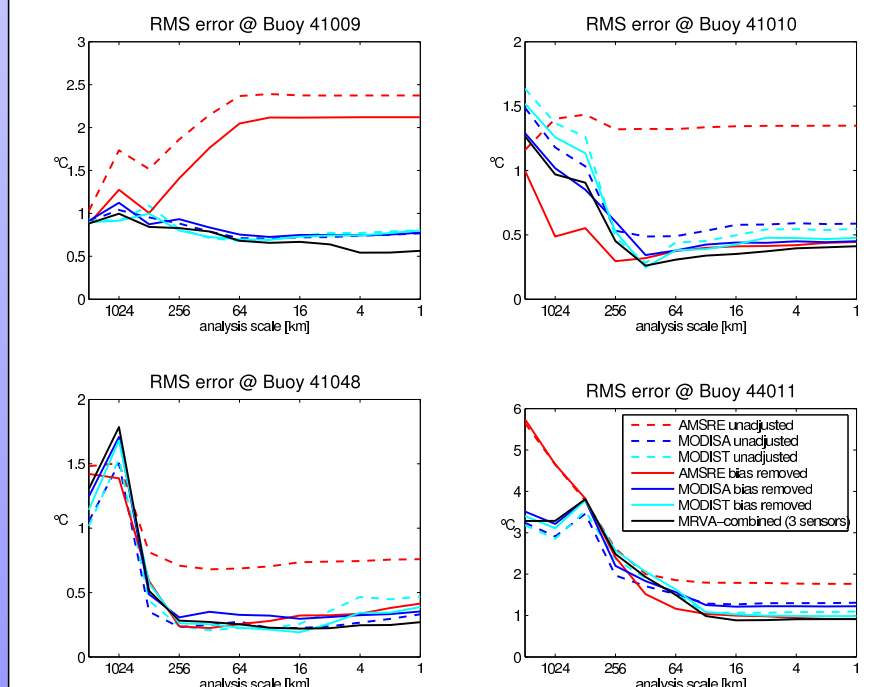
⇒ Multi-sensor analysis consistently has the lowest RMS.

## Buoy comparison

Interpolated AMSRE and MODIS(Aqua/Terra) data sets are compared against *NDBC moored buoy* data:



## RMS difference to buoys in N.W. Atlantic



## Summary

- Inter-satellite and buoy comparisons are used to examine:
  - data biases
  - analysis techniques and parameters (e.g., resolution)
- Bias values (in GHRSSST files) were useful for combining **AMSRE (MW)** and **MODIS-A/T (IR)** data.
- **Multi-sensor combination** improves agreements with buoys and AATSR data *consistently*.



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